Technological characteristics of the exogenous nucleic acids application in the *Bombyx mori L.* growing

Potopalsky A., Drozda V.

Institute of Rehabilitation and Renewal of the Ukrainian Nation, Kyiv, Ukraine
Institute of Molecular Biology and Genetics of NAS of Ukraine, Kyiv, Ukraine
National Agrarian University, Kyiv, Ukraine

Insects are good models for morphogenetic processes study. With this aim, along with drosophila, is used the silkmoth where an interconnection of genetic and morphologic changes in ontogenesis was investigated on maximal detailing level. This fact enables a regularity comparison of the nucleic acids exchange in the insect embryogenesis along with genetic material accumulating and existing genetic information realization that is very important in the theoretical aspect.

On the beginning of the ontogenesis, the prevailing number of events in the growing embryo is automatically regulated that is provided with the stepwise use of accumulated and anew made structural information and reserve materials along with distinct related intracellular processes and cell-cell interactions. It is obvious that on the early ontogenesis stages the molecular mechanisms, which have a decisive importance for realizing the mature organisms' characteristic, perform. Naturally, leading hand in this process belongs to the structural nucleic acids metabolism and their particularities.

On the basis of the common purpose, concluded in searching of the rational methods and means of increasing silkmoth productivity, the next technological particularities of this program realization were solved: selection of the optimal compounds – biostimulants, methods of their administration into insect's organism, and stage – that would have biologically based and rational effect.

In the program of long-term researches we used the silkmoth industrial hybrid, grown from a grain of Mirgorod grain factory. As the productivity stimulants were used uracil ($C_4H_4H_2O_2$) (URL), or methyluracil (MT) or 5-piperidine-methylene-methyluracil (BES-221). These compounds were used for treatment the silkmoth eggs during spring reactivation on the 2-5 day of their growth that corresponds to the periods of the mouthparts and thoracic legs appearance on the frontal metameres and blastokinesis. Furthermore, on the fifth stage of caterpillar age were used nucleic acids – native yeast RNA, purified by the Institute of Molecular Biology and Genetics method (RN), RNA, modified by thiophosphamide (RNT) and RNA, modified by cyclophosphamide (RNC). Simultaneously from the same grain were grown caterpillars without conduction of any treatment (control), and with use of better analogue.

It is determined that the silk capsule mass of cocoons, grown according to the original technology, exceeded the similar index of the better analogue on 32 and 40%. The native and modified preparations of RNA predecessors, URL, MT and BES-221 in the offered technology were used on embryonal stage of the silkmoth growth with the purpose of their growth intensification and biomass accumulation. The effect of RNA predecessors in the range of 0,10-0,02% concentrations showed high effectiveness. Higher or lower concentrations cause considerable silkmoth productivity decrease. Besides, the obtained results testify the efficiency of stimulating on the initial stage of the grain growth including the fifth day.

In table 1 illustrated the results of an impact of grain treatment duration on the silkmoth productivity indexes. Evidently, the optimal exposition is 1h-1.45h duration of the grain treatment. The result of a grain treatment by such preparations as URL, MT and BES-221 is a considerable intensification of the caterpillars' growing process and accumulation of their biomass, which partially transforms into the silk, and partially remains in the pupa body. High index of the pupae mass testifies about an existence of the plastic and energy material reserves in the silkmoth organism, which can be to a certain extent transformed into the silk thread protein.

The next constituent of the silkmoth growing technology is the caterpillars' forage treatment by the water solutions of the native and modified yeast RNA, RN, RNT and RNC in a first half of the fifth caterpillars' age. The use of these biostimulants specified by the included substances that efficiently transform caterpillars' biomass to target product – silk thread of the cocoons capsules.

Use of the stimulants only in a first half of the fifth caterpillars’ age specified by the increasing of the cocoons’ comparative silk-bearing feature after treatment during this period, otherwise, by more effective transformation of the protein resources into silk raw material on a caterpillar stage. A treatment in the later periods allows only insignificant proportional increasing of the both component parts – cocoon-pupa and silk capsule. The materials of the tables 1 and 2 indicate a high specificity of the preparations effect that exhibits in increasing of a silk issue on 4-7% comparing to the control variant. Such an automatic directedness of metabolism processes on mainly silk protein formation is a reason of the pupae mass decreasing on 5-10% in most cases that testifies about using of some protein reserves on transforming into the silk capsule cocoon proteins.

Thus, a high effectiveness of each group of used native and modified DNA, RNA is demonstrated. It is essential to underline that these developments concerning the beneficial silkmoth growing technologies are original, have no other analogues and protected by the whole range of the author's certificates and patents.

Table 1

Productivity of the silkmoth, grown from the grain after applying the RNA predecessors on the third incubation day at different effect duration

Variant	Treatment exposition, minutes	Males, mass, mg/% before the control			Issue of the silk raw material, %	Males, mass, mg/% before the control			Issue of the silk raw material, %
		Cocoon	Pupa	Capsule		Cocoon	Pupa	Capsule	
Control (water)	-	1835	1524	311±7	16,95	1520	1218	302±8	19,87
MT, concentration 0,02%	60	2118 115,4	1707 112,0	411±12* 132,2	19,40 +2,45	1797 118,2	1394 114,4	403±12* 133,6	22,43* +2,56
	105	2883 113,5	1677 110,0	406±13* 130,7	19,50 +2,54	1779 117,0	1391 114,2	388±11* 128,4	21,81* +1,94

Note: here and below, the indexes of the silk capsule size, pointed out by asterisks, statistically may exceed the control indexes.

Table 2

The native and modified yeast RNA effect on the silkmoth productivity after treatment in first half of the fifth caterpillar age

Variants	Concentration, %	Males, mass, mg/% before the control			Issue of the silk raw material, %	Males, mass, mg/% before the control			Issue of the silk raw material, %
		Cocoon	Pupa	Capsule		Cocoon	Pupa	Capsule	
Control (water)	-	2022	1673	349±11	17,26	1468	1174	294±9	20,03
RN	0,040	20,60 / 101,9	1597 / 95,4	463±10* / 132,8	22,48 / +5,25	1436 / 97,8	1042 / 88,7	394±8* / 133,9	27,44* / +7,41
	0,008	2161 / 100,9	1682 / 100,5	479,9* / 137,2	22,17 / +4,91	1487 / 101,3	1113 / 94,8	374±6* / 127,4	25,15* / +5,12
RNC	0,040	2040 / 100,9	1585 / 99,7	455±9* / 130,4	2230 / +5,04	1521 / 103,6	1115 / 95,0	406±11* / 138,0	26,70* / +6,67
	0,008	2158 / 106,7	1691 / 101,1	467±10* / 133,8	21,64 / +4,38	1567 / 106,7	1169 / 99,6	398±9* / 135,6	25,40* / +5,37
RNT	0,040	2123 / 105,0	1641 / 98,1	482±8* / 138,1	2270 / +5,44	1542 / 105,0	1126 / 95,9	416±9* / 141,4	26,97* / +6,94
	0,008	2118 / 104,7	1665 / 99,5	453±13* / 129,9	21,39 / +4,13	1531 / 104,3	1148 / 97,9	382±10* / 130,1	24,95* / +4,92